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AUTOMATIC FIREARM

Filed April 20, 1926

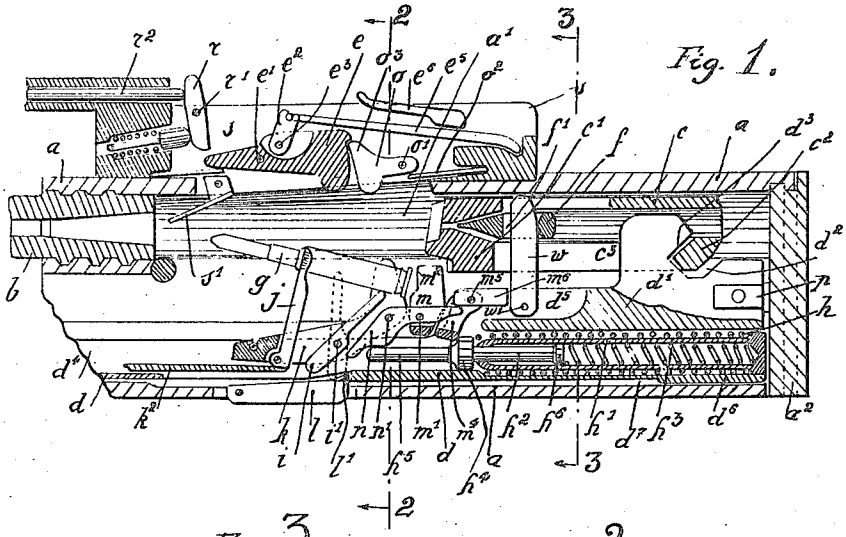


Fig. 1.

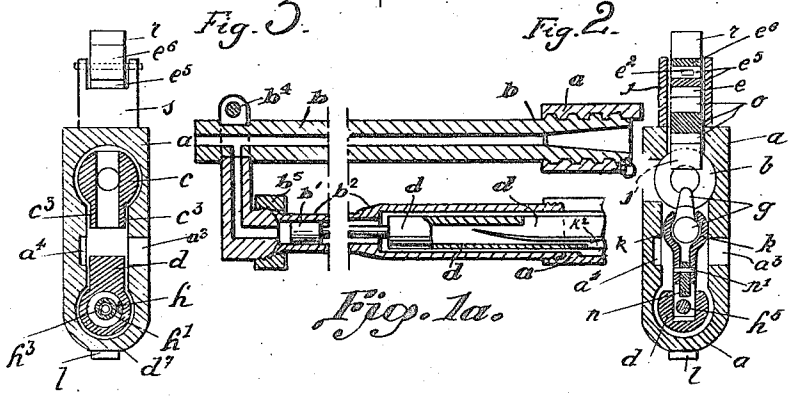


Fig. 3.

Fig. 2.

Fig. 1a.

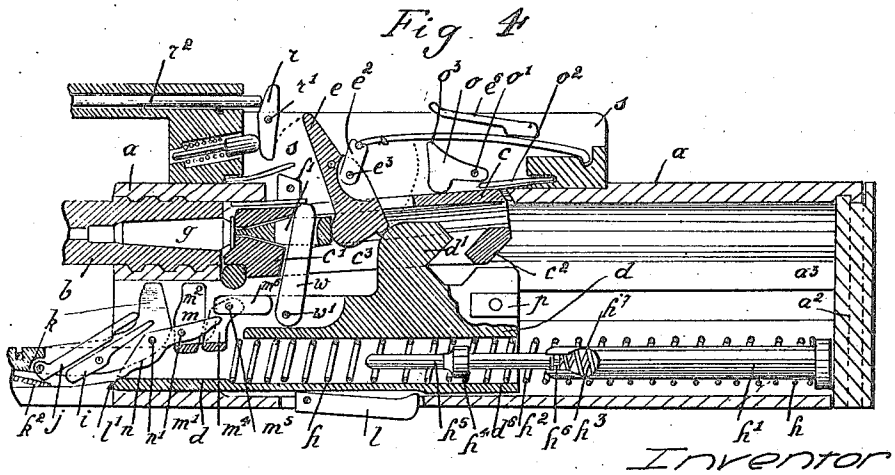


Fig. 4

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AUTOMATIC FIREARM

Application filed April 20, 1926, Serial No. 103,369, and in France April 22, 1925.

The present invention relates to automatic firearms, such as machine-guns, automatic rifles or automatic pistols, for war or defence.

The invention has reference to;—

(1) An arrangement which prevents the working of the firing sear, so long as the arm is not loaded.

(2) An arrangement which stabilizes the cartridge seized in the lifting carrier, in spite of the shock imparted to the breech-bolt at the end of its rear stroke.

(3) Various arrangements which prevent the distortion of the cartridge which is being fed forward.

(4) A firing mechanism mounted outside the movable parts of the firearm and ensuring an instantaneous discharge with a view to firing through the field of the propeller in aircraft.

(5) Various arrangements which improve the resistance to wear of the parts of automatic firearms operating by means of gas.

The invention is represented, by way of example, in one form of carrying it out, upon the annexed drawing in which:—

Figure 1 is a view in longitudinal, axial section of the firearm, in the position of extreme opening of the movable breech-bolt, Fig. 1^a is a longitudinal axial section of the fore part of the firearm. Figures 2 and 3 are views in transverse section, on lines 2—2 and 3—3 respectively of Figure 1.

Figure 4 is a view corresponding with that of Figure 1 but in the position having the breech bolt closed and the firing pin mechanism unlatched.

The firearm represented is of the gas-operated type; the latching of the breech bolt c between the rear of the barrel b and the breech casing a in the space a^1 provided for that purpose in casing a, and also the unlocking of this breech bolt c are effected by the movements of a breech bolt operating slide d; this last-mentioned is actuated, in the well known manner, in one direction by the admission (see Fig. 1^a) of a part of the gases, when the bullet is expelled near the front end of the barrel b through a connection or unit b^3 into a cylindrical member b^2 threaded into the lower part of the breech casing a. Said gases are adapted to act upon a piston b' operating in said cylindrical member b^2 and connected to the breech bolt operating slide d. The connection (or union) b^3 consists of a member bored at right angles and comprising at its top a collar shaped slotted part clamped to the barrel b by a cross bolt b^4. The said member b^3 is connected to the cylindrical member b^2 by a ring nut b^5. The breech bolt operating slide is actuated in the other direction by the opposing action of the recuperator spring h upon the opposite extremity of the breech bolt operating slide d (at the right of Figures 1 and 4). The boss or lug d^1 formed at the rear of the breech-bolt operating slide d acts by means of inclined planes d^2 d^3 upon corresponding inclined planes on the movable breech bolt c in order to effect its latching and its unlocking.

The cartridges g are removed from the belt and are introduced into the chamber in the barrel b by a lifting-carrier which comprises three arms mounted in a longitudinal vertical slot d^4 in the breech-bolt operating slide d, the two outer arms k forming a spring and having upper portions acting as a gripper (Figure 2) to engage the cartridge g in advance of its rear rim or beading, whilst the middle arm j forms a support to raise the front portion of the cartridge.

Between the inner arm j and the gripper portions of the outer arms k, is pivoted at i^1 upon the lifting carrier, a lever i which is adapted to receive near its pivotal axis the thrust of another lever n pivoted at n^1 and also between the outer arms k of the lifting carrier; the action of the single spring k^2, located in the slot d^4 of the breech-bolt operating slide d, tends to raise the lifting carrier and all the parts which are pivoted thereupon; but the rear beak of the tumbler n, making contact with the lever m^6 pivoted at m^5 in a cut-out portion d^5 of the breech-bolt operating slide d, effects an upward movement of the front beak of the tumbler n which tends continually to tilt the lever i upwardly; in this raised portion (indicated in dotted lines in Figure 1), the lower part of this lever i takes up a position inside the sear-notch or nick l^1 cut in the lower part of the breech-

bolt operating slide d and this prevents the sear or pivoted member l from engaging in this notch l^1; the firearm is consequently prevented from remaining with its breech bolt c in the open position. But a cartridge g when gripped in the lifting carrier by its presence prevents the lifting or tilting of the lever i; the notch l^1 is thus empty and the breech bolt operating slide can remain in the position corresponding with the opening of the breech bolt c (as shown in full lines in Figure 1). This arrangement allows the operator to see if his weapon is really loaded or not, by the single fact that it remains cocked or not-cocked upon the sear l, manually operated by a trigger, not shown. This firing sear l serves to interrupt the shooting, with the movable slide (or block) c in the open position, in arms which do not have an independent firing mechanism and in which percussion in assured by a simple firing pin fixed on the solid part of the operating slide d.

When the arm is provided with a synchronized firing mechanism, such as shown on the drawing of the application, this firing sear 1 may be omitted. The operations for loading the firearm are thus greatly accelerated and many accidents are avoided in use. Under the violence of the shock of the breech-bolt operating slide d against the rear plate a^2 of the breech casing a, the cartridge g performs a slipping movement, by reason of its inertia, between the grippers k of the lifting-carrier; this slip might cause it to escape too soon from engagement by the carrier and thus give rise to irregularities in the working of the firearm. In order to avoid this inconvenience, the cartridge feed-mechanism is provided with a tumbler m which is U-shaped and is pivoted at m^1 upon the lever n which is pivoted at m^1 between the arms of the lifting carrier jk; a little before the breech bolt operating slide d strikes against the butt-plate a^2, the front extremity of the guide h^1 of the recuperator spring h meets a second oscillating member m^4 which is also U-shaped and is pivoted at m^5 in the cut-out portion d^5 of the breech-bolt operating slide.

The oscillation of this member m^4 causes the lifting of the tumbler m and forces it, by means of its inclined face m^2 at its front upper part, against the rear of the cartridge g. The undue slip of the cartridge is thus avoided; nevertheless when the breech bolt operating slide d is sent forward by the recuperator spring h, the tumbler m can freely turn over rearwardly until it bears against the member m^4; the tumbler m then presents its front inclined face m^2 in a suitable position opposite the base of the cartridge g in order to assist the releasing or removal of the said cartridge from the lifting-carrier for the purpose of feeding it into the chamber of the barrel b. It will be remarked that the base of the cartridge g cannot take up a position, by reason of faulty manipulation, above the inclined face m^2 of the tumbler m, as would be possible if this tumbler m would be pivoted upon the breech-bolt mechanism in place of being pivoted upon a lever n itself pivoted upon the lifting-carrier.

The guide for the recuperator spring h is preferably, as shown, formed in two telescoping portions h^1 h^2 with an internal spring h^3; this arrangement has the following advantages:—

(1) It avoids the abrupt shock at the end of the rearward stroke between the oscillating member m^4 and the front extremity of the spring-guide, and consequently avoids the possibility of wear and shake in these parts.

(2) It prevents damage to the cartridge g at the time of its introduction into the chamber in barrel b; for this purpose, the inner telescoping part h^2 of the spring-guide comprises, beyond its head h^4, a prolongation or stem h^5 of such a length that, at the time of the return forwardly of the breech-bolt operating slide d, the rear enlargement h^6 of this part h^2 meets a contracted or inturned portion at the front of the rear telescoping part h^1 of the spring-guide; this contracted portion stops the forward stroke of the part h^2 of the spring-guide, which thus frees the parts m and m^4, whilst the front stem h^5 of the spring guide remains engaged, for a further distance of some millimetres, below the lever n.

Now at this moment, the cartridge g, partly entered into the chamber of the barrel b, becomes precisely freed from the lifting carrier j k. The support thus temporarily assured to the lifting carrier by the prolongation h^5, by the intermediary of the lever n, prevents this lifting carrier from being lowered at the moment of the action of removing the cartridge g out of the grippers of the lifting carrier, and consequently avoids the bending effect which would otherwise be imparted to the cartridge. The length of the front prolongation h^5 of the spring guide is regulated in such a manner as to permit the lowering of the lifting-carrier immediately after the cartridge g has been freed therefrom.

As shown in Figure 4, the outer telescopic part h^1 of the spring-guide is provided near its front end with a side aperture h^7 through which the rear enlargement h^6 of the interior telescopic part h^2 can be passed out, which arrangement allows the device to be dismounted by hand.

The lower cylindrical body d of the breech bolt operating slide comprises, near its rear extremity, a portion d^6 of larger diameter which alone bears upon the bore of the breech casing a, which arrangement avoids useless friction and affords, between the bore

of the breech casing and the largest part of the cylindrical body of the breech bolt operating slide, an empty space d^7 for the evacuation of foreign matter which may have entered the firearm.

As shown in Figures 1, 3 and 4, the two projecting portions or lugs c^1 and c^2, at the front and at the rear of the movable breech, are connected together by cheeks or lateral ties c^3 c^3 which may be integral therewith and which increase the resistance to wear of the breech bolt.

The slot or slideway a^3, formed in one of the side walls of the breech casing a for the passage of the stem p of the manipulating handle or stud, is extended to the rear end of the breech casing, which arrangement avoids the dismounting of the manipulating handle, accelerates the dismounting of the firearm and permits of a more solid construction of the parts; this slideway a^3, as well as a groove a^4 hollowed out opposite the slideway a^3 up to half the thickness of the opposite side wall of the breech casing, can be utilized to guide the breech bolt operating slide d in its movements, by the intermediary of the extended stem p of the operating handle or stud, securely fixed or riveted in the breech bolt operating slide d; this guiding arrangement thus causes the manipulating handle or stud to absorb the largest portion of the work imposed hitherto on the lower cylindrical body d of the breech bolt operating slide.

The quick firing mechanism, which allows the discharge to be synchronized with the movement of rotation of the motors of aeroplanes for fire through the field of the propeller, presents this feature that it is wholly located not in the breech bolt operating slide and not in the movable breech bolt, but in an open box s fixed to to the breech casing a at the upper part of the firearm.

This firing mechanism comprises a hammer e arranged in such a way that it can oscillate at e^1 between the two lateral cheeks or walls of the box s and to which hammer is imparted, by means of a connecting rod e^2 pivoted at e^3 upon the hammer e, the thrust of a plate spring e^5.

The release of the firing mechanism is effected by the movable breech c which, as it rises for its latching, acts upon the automatic sear o which is pivoted at o^1 upon the box s; the hammer e is released and tends to turn in a clockwise direction but its stroke is immediately stopped by the second sear r, which is pivoted at r^1 upon box s and which allows the hammer e to fall upon the pin f only at the moment when the motor imparts, by the usual intermediate mechanism, a thrust on the rod r^2 which moves aside this seceond sear r (Figure 4).

The recoil of the movable breech bolt c effected by the breech bolt operating slide d causes the hammer e to pivot in the opposite direction in order to be re-cocked; for this purpose, a lever w, pivoted at w^1 upon the breech bolt operating slide d and passing through a longitudinal axial slot f^1 in the firing pin f, is subjected, as a result of the recoil of the breech bolt operating slide d, to a movement of oscillation which lifts its upper extremity; the latter acts upon the hammer e in such a way as to complete the angular movement of rotation of the hammer, in a contra-clockwise direction, so as to bring this sear or hammer e into engagement with the beak o^3 of the automatic sear o, which is itself freed by reason of the lowering of the breech bolt c (Figure 1) and subjected to the action of the plate spring o^2.

The movement of oscillation of the lever w at the time of the opening of the firearm has also for object to effect a recoil movement of the firing pin f and this recoil movement prevents, at the time of closing the firearm, the firing pin which projects in front of the movable breech bolt c, from causing a premature discharge. On the other hand, when the movable breech bolt stops in the latching position, the breech bolt operating slide d, which continues its forward stroke, carries along the lever w, which oscillates and allows the firing pin f to proceed forward when it is struck by the hammer e. This lever w thus forms a safety device.

The mounting of the plate spring e^5 is facilitated by a cam-fitted lever e^6 pivoted upon the box s and enabling the spring e^5 to be tensioned or slackened by hand, without any tool.

The box s, between the lateral cheeks of which are pivoted the devices e o e^6 and r is also provided, to the rear of the chamber of the barrel b, with an inclined oscillating plate s^1 which is held suitably directed and is tilted up by the breech bolt c when the latter slides forwardly for its latching action; this inclined plate s^1 has for object to guide the cartridge g which is being fed forward in order that it may be correctly directed into the chamber of the gun-barrel.

What I claim is:

1. In an automatic fire arm of the breech bolt type having the usual breech bolt, firing sear coacting with a notch in the breech bolt, and a spring actuated cartridge carrier with grippers, means to prevent the firing sear from stopping the breech-bolt in the position of opening the fire-arm so long as no cartridge is in the lifting-carrier, said means comprising a pivoting member to which the absence of a cartridge, in the grippers of the lifting carrier, allows a pivotal movement such that one of its extremities, by closing the sear notch in the breech bolt operating slide prevents the hooking of the breech bolt operating slide over the sear, thus indicating the operator whether or not the firearm is

loaded by the fact that it remains or does not remain in the open position.

2. An automatic firearm according to claim 1, the said pivoting member being formed by a lever fulcrumed upon the lifting-carrier and another lever controlling said first named lever also pivoted on the lifting-carrier and bearing at one of its extremities upon the breech-bolt operating slide, under the action of the spring of the lifting carrier, in order to bring the first mentioned lever into the position which prevents the hooking of the sear, when this lever is not stopped in its pivoting movement by the rear part of the cartridge seized by the lifting carrier.

3. An automatic firearm having a breech bolt, means for avoiding undesirable movements of the cartridge which is being fed by the lifting carrier, such movements being due particularly to the shock at the end of the rearward stroke of the breech bolt operating slide, the said means including a pivoted member provided with an inclined ramp, which serves for the removal of the cartridge from the carrier, a recuperator spring, a guide therefor, said ramp carrying member being subjected to an erecting movement around its pivotal axis shortly before the shock at the end of the rear stroke of the breech bolt operating slide, by the contact of the base of said member, which carries the ramp, against the front extremity of the guide for the recuperator spring.

4. In an automatic firearm having a device for avoiding undesirable movement of the cartridge as claimed in claim 3 in which a seceond member is pivoted between the front of the bolt operating slide and the first member carrying the inclined plane or ramp, this second member striking the front end of the guide of the recuperator spring shortly before the end of the rearward stroke of the slide and causing by its oscillation, the erecting movement of the first member, so as to present the inclined plane of the latter against the rear of the cartridge.

5. An automatic firearm as claimed in claim 3, the recuperator spring guide in two parts capable of sliding one within the other, a spring situated in the fixed rear part of the guide to which the front movable part is subjected in such a way as to avoid, at the end of the rear stroke of the breech bolt operating slide, the shock of the member which is fitted with the ramp serving for the removal of the cartridge against the front extremity of this recuperator spring guide, and to avoid distortions resulting therefrom.

6. An automatic fire-arm including a carrier for lifting the cartridge into the barrel chamber, a two part recuperator spring guide having a head at one end adapted to engage beneath said carrier under the action of a cartridge partly engaged in the barrel chamber but not yet entirely removed from the carrier, so as to prevent the carrier from being lowered, thereby avoiding the bending effect of the carrier upon the shell of the cartridge.

7. Instantaneous firing mechanism for guns adapted to fire between the moving propeller blades in aircraft, comprising a housing detachably secured to the breech casing of the gun, a firing hammer pivotally mounted in said housing, spring-actuated means adapted to operate said hammer also mounted in said housing, a first sear pivotally mounted in said housing adapted to maintain said hammer cocked until said sear is tripped by the lifting movement of the breech bolt in the breech casing, a second sear pivotally mounted in said housing and adapted to hold the hammer cocked until a predetermined moment independent of the tripping of said hammer by the first mentioned sear, means carried by said housing and actuated by the motor that turns the propeller for operating said hammer-holding sear to release said hammer, said housing and the parts mounted therein being movable from the gun as a unit, the said first and second sears being pivoted within the housing on opposite sides of the pivotal axis of the hammer and being adapted to engage with said hammer at a relatively long distance from the pivotal axis of the hammer.

8. Instantaneous firing mechanism for guns adapted to fire between the moving propeller blades in aircraft, comprising a housing detachably secured to the breech casing of the gun, a firing hammer pivotally mounted in said housing, spring-actuated means adapted to operate said hammer also mounted in said housing, a first sear pivotally mounted in said housing adapted to maintain said hammer cocked until said sear is tripped by the lifting movement of the breech bolt in the breech casing, a second sear pivotally mounted in said housing and adapted to hold the hammer cocked until a predetermined moment independent of the tripping of said hammer by the first mentioned sear, means carried by said housing and actuated by the motor that turns the propeller for operating said hammer-holding sear to release said hammer, said housing and the parts mounted therein being movable from the gun as a unit, the said cooperative removable parts including an eccentric lever pivotally mounted in said housing and adapted to control the spring actuated means for operating the hammer.

9. A safety device for automatic fire-arm of the type having breech bolt with breech bolt operating slide and a firing pin carried by the breech bolt including means comprising a lever pivoted upon the breech bolt operating slide and connected to the firing pin located in the movable breech, the recoil move-

ment of the breech bolt relative to the breech having for its object to impart to this lever a movement of oscillation which brings back the firing pin rearwardly to an extent sufficient to prevent the firing operation.

10. An automatic fire-arm as claimed in claim 9 including a firing hammer and a sear having a nose engageable with said firing hammer in a certain position of the latter, the said lever pivoted to the breech block slide being arranged upon recoil of said slide to bring said firing hammer into engagement with the nose of said sear for completing the recoil of said hammer.

11. In automatic firearms, a breech bolt operating slide comprising, at the rear part of its lower cylindrical body, a portion of larger diameter which alone is intended to bear upon the bore of the breech-casing with a view to diminishing friction, to afford a space favourable for the evacuation of foreign matter, and to strengthen the breech bolt.

12. An automatic firearm, comprising a manipulating handle fixed in a permanent manner to the breech bolt operating slide, with a view to facilitating the dismounting of the internal devices, said handle passing through a longitudinal slideway or slot formed in one of the walls of the breech casing and being prolonged to the rear extremity of this breech casing.

13. An automatic firearm, according to claim 12, the manipulating handle being utilized to guide the breech bolt operating slide in its longitudinal movements, first, along the slideway which allows the passage of the manipulating handle in one of the walls of the breech casing and, secondly, along a groove formed in the opposite wall of the breech-casing for part of the thickness thereof, the work imposed on the lower cylindrical body of the breech bolt operating slide, for the latching and the release of the breech bolt, being thus reduced by the support of the manipulating stud upon the breech casing.

In testimony whereof I have signed my name to this specification.

REGIS DARNE. [L. S.]